

The Effect of *Dreissena polymorpha*
on Native Mussel Species in
Missisquoi Bay



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Background



- Zebra mussels (*Dreissena polymorpha*) invaded Lake Champlain in 1993
- They attach to hard substrates including native mussels
- They cover sand and silt forming ‘druzes’
- Increase macroinvertebrate abundance and diversity (Ward & Ricciardi, 2007)
- Have both positive and negative effects on native species (Beekey *et al.*, 2004)



Zebra Mussel Effects

Positive

- Extra space → hide from predators
- Surface area → space for colonization
- Feces → nutrients

(T.W. Stewart *et. al*, 1998)

Negative

- Food & Space Competition
 - Attachment to mussels
- Disease and Parasitism



<http://www.okbassfednation.com/ZebraMussel.jpg>

(Schmidlin & Schmera, 2012)

Hypothesis

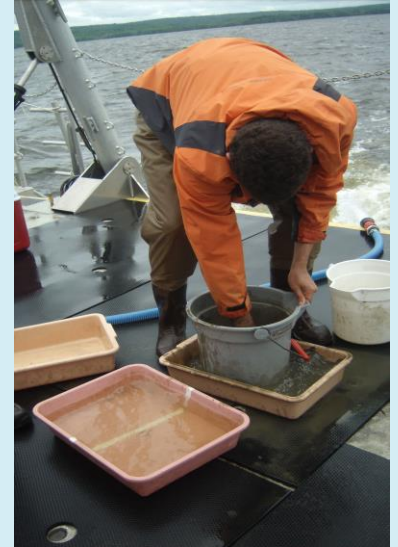


When the species richness and abundance of the native mussels *Elliptio complanata*, *Lampsilis radiata*, *Lampsilis ovata*, *Pyganodon cataracta*, *Pyganodon grandis*, and *Pisidiidae* increases, the number of zebra mussels will also increase.

Field Methods



- 334 samples from Missisquoi Bay floor using a petite ponar sampler
- Rinsed samples through a 0.5mm sieve
- Samples preserved with 100% EtOH
 - tag with the date, latitude, longitude, and sample number.



Lab Methods



- We picked out and recorded:
 - macroinvertebrates, full snail shells, empty snail shells, full mussels, and empty mussel shells
- Organisms transferred to 70% EtOH, 1% glycerin
- Identified macroinvertebrates to the lowest practical taxonomic unit using a dissecting microscope and taxonomic keys.

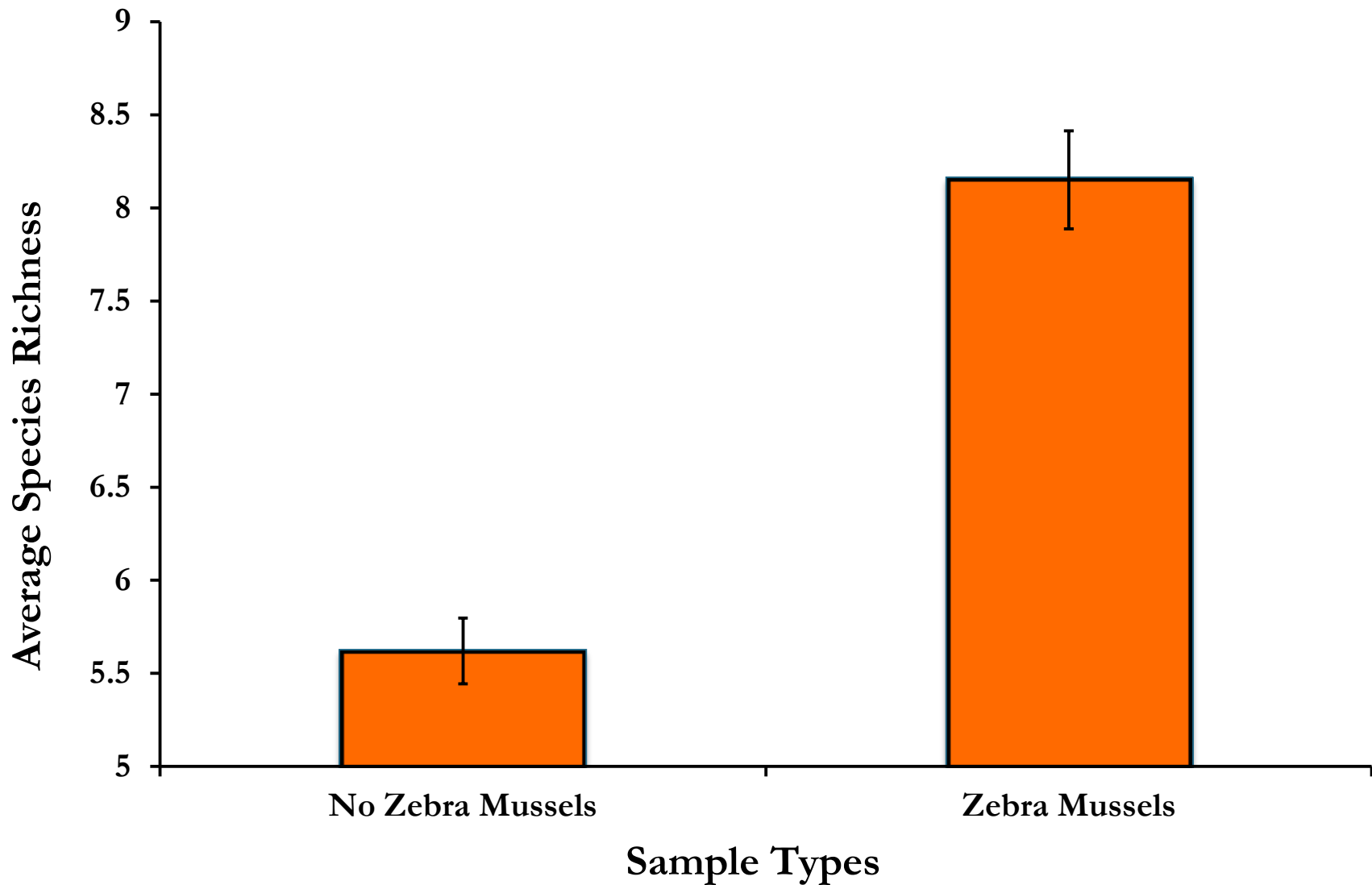


Figure 1. A comparison of the average species richness between samples that contained *Dreissena polymorpha* and that did not contain *Dreissena polymorpha* (ANOVA; $p < .001$).

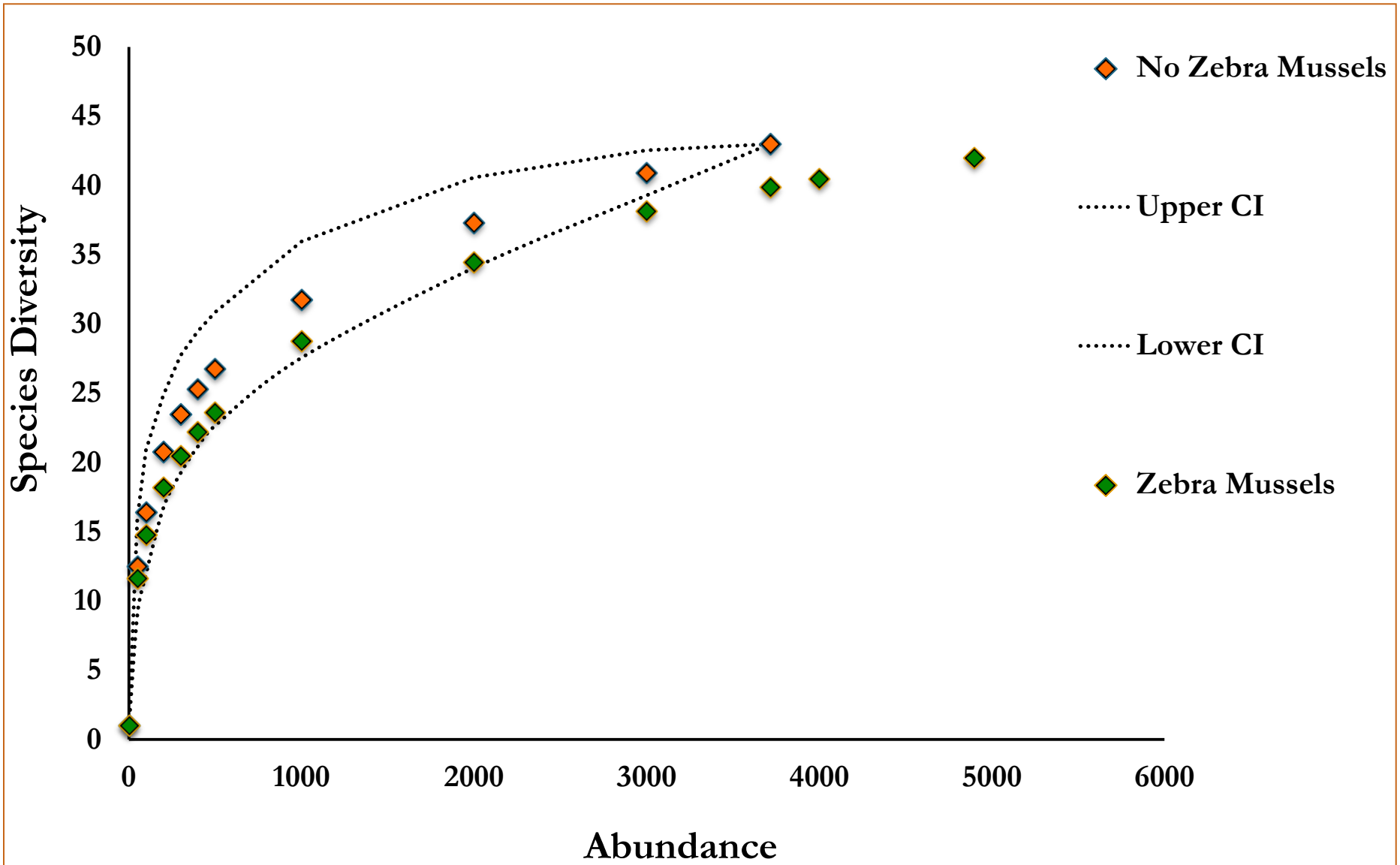


Figure 2. Rarefaction curve with 95% confidence intervals comparing 334 samples from Missisquoi Bay

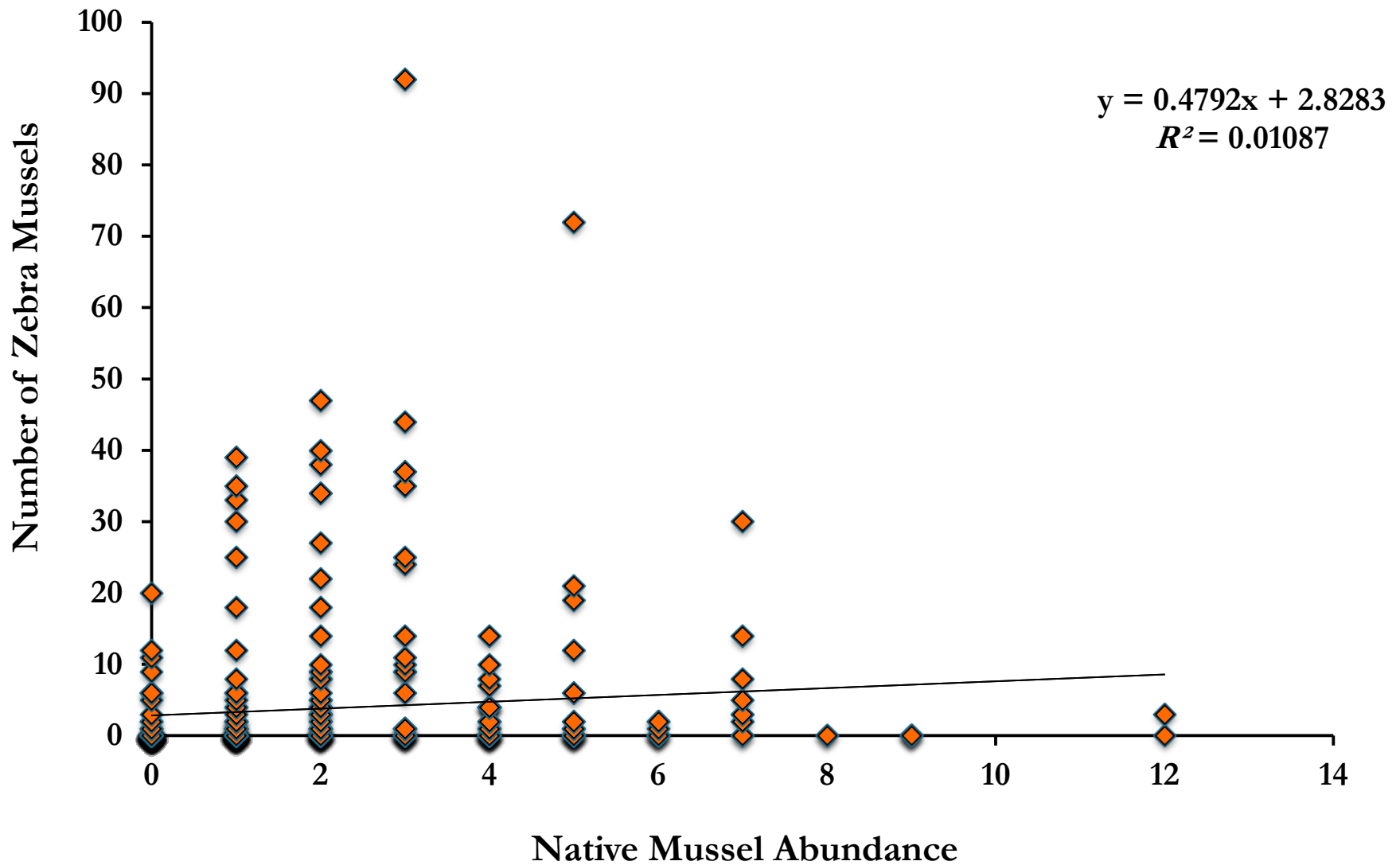


Figure 3. The effect of the abundance of the native mussels on the number of zebra mussels in the Missisquoi Bay (linear regression; $p=.057$).

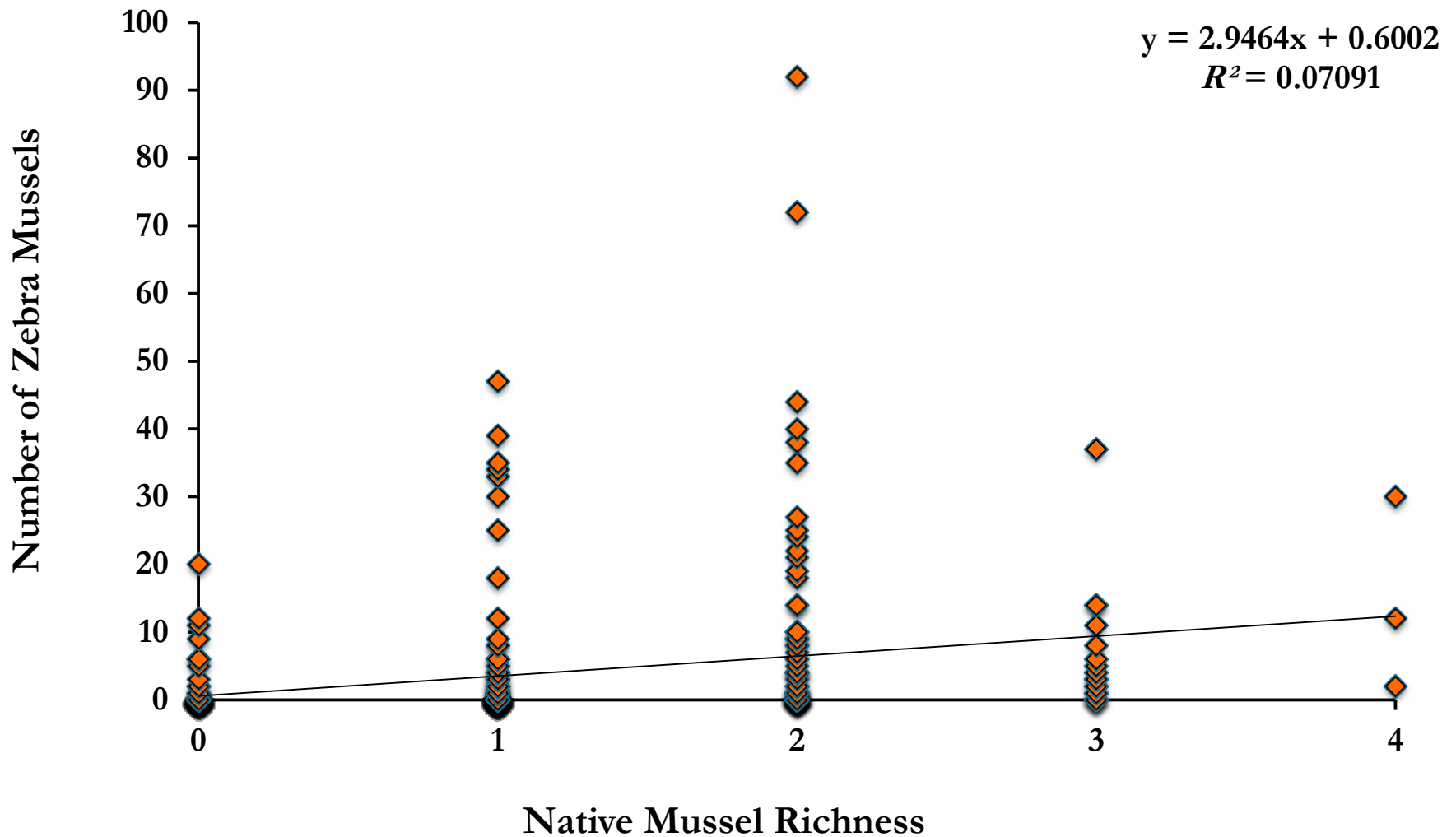


Figure 4. The effect of the species richness of the native mussels, on the number of zebra mussels in the Missisquoi Bay (linear regression; $p < .001$).

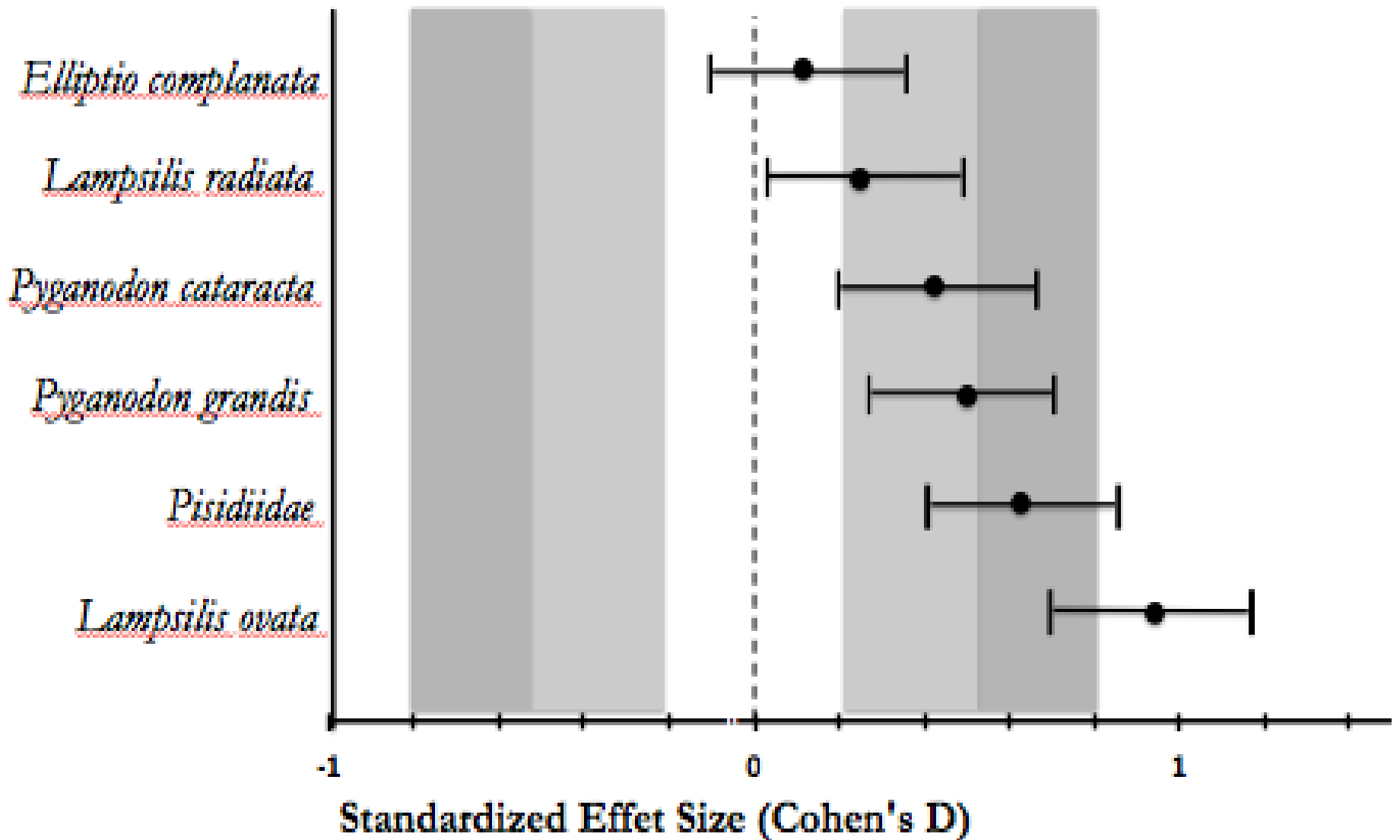


Figure 5. Effects of zebra mussels on native mussel abundance in Missisquoi Bay. Confidence intervals intersecting the zero line indicate no difference between samples with and without zebra mussels.

Discussion



- Zebra mussels attach to native mussels and compete for resources
 - provide resources for other macroinvertebrates
- Rarefaction graph suggests that richness response is the result of “passive sampling”: more total abundance leads to higher richness
- *Elliptio complanata* is more tolerant of zebra mussels (Hallac & Marsden, 2000)
- How are zebra mussels affecting the algae blooms in Lake Champlain?

Acknowledgements



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Works Cited



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Questions?